**Title:**

Data presented in de Smit et al. 2024, ‘Storm resilience of subtidal soft-bottom mussel beds: mechanistic insights, threshold quantification and management implications’ in the *Journal of Applied Ecology*.

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**These files include the raw data used to create figures in the manuscript, organized as follows:**

1. Field monitoring

a) Accelerometer

b) Pressure sensor

2. Flume study

a) Dislodgement test

b) Long exposure experiment

**Field monitoring - Accelerometer**

* *Data*

“Scheur\_1.csv”

“Scheur\_2.csv”

“Scheur\_3.csv”

“Scheur\_4.csv”

“Scheur\_5.csv”

“Scheur\_6.csv”

“Scheur\_7.csv”

“Scheur\_8.csv”

* *Figures*

“Figure3.png”

“Figure4.png”

* *Description*

Small accelerometers (MSR-145B4) were used for continuous and high-frequency recording of mussel movements over the long term. With dimensions and a weight of 18 g comparable to those of individual mussels, these accelerometers were suitable for integration into mussel patches. To ensure natural aggregation within the existing mussel bed, approximately 10 live mussels were glued onto each accelerometer, creating small clumps of mussels housing an embedded accelerometer (Mussel Clump Accelerometer, MCA). During the storm season of 2021-2022, a total of 30 MCAs were deployed at eight locations along a depth transect in Scheurrak tidal inlet in the Dutch Wadden Sea, with water depths ranging between -4 and -2 m NAP (Dutch ordinance level). Data recorded by these MCAs can be found in the data frame within the following file:

* “Scheur\_1.csv”, “Scheur\_2.csv”, “Scheur\_3.csv”, “Scheur\_4.csv”, “Scheur\_5.csv”, “Scheur\_6.csv”, “Scheur\_7.csv”, “Scheur\_8.csv”

Here are the eight files that display the accelerometer readings recorded by the MCAs deployed at eight different locations. Each of these files contains a sheet with the same structure. The first column “*Time*” shows the time of data recording, while the second to fourth columns (“*X*”, “*Y*”, “*Z*”) present the acceleration recorded in the X, Y, and Z directions, respectively. The acceleration readings in these three directions were used to calculate the movement intensity of the mussel clusters. For the specific calculation method, please refer to the section "Novel method to quantify mussel movement" in the related publication. The data from these eight files were aggregated to create Figure 3.png and Figure 4.png.

**Field monitoring - Pressure sensor**

* *Data*

“Scheur\_1.csv”

“Scheur\_2.csv”

“Scheur\_4.csv”

“Scheur\_5.csv”

“Scheur\_6.csv”

“Scheur\_8.csv”

* *Figure*

“Figure 3.png”

* *Description*

To link MCAs movement to hydrodynamic forces, waves were measured using pressure sensors (OSSI-010-003C). These sensors were deployed along the same transect, measuring water depth at a frequency of 10 Hz during 7.5-minute burst with 15-minute intervals between bursts. Two sets of MCAs did not have an adjacent pressure sensor due to practical limitations, thus the data from the nearest pressure sensor, deployed at a similar water depth, was used. Data recorded by these sensors can be found in the data frame within the following file:

* “Scheur\_1.csv”, “Scheur\_2.csv”, “Scheur\_4.csv”, “Scheur\_5.csv”, “Scheur\_6.csv”, “Scheur\_8.csv”

Here are the six files that display the wave information recorded by the pressure sensors deployed at six different locations. Each of these files contains a sheet with the same structure. In each file, the columns include “*time*”, which indicates the Year-Month-Day-Time the data was recorded; “d” describes the water depth; “*Hm0*” records the wave height; “*u*” records the near-bed orbital velocity. This data can be used to produce the blue lines (i.e., Near-bed orbital velocity) in “Figure 3.png”.

**Flume study – Dislodgement test**

* *Data*

“Dislodgement test.csv”

* *Figure*

“Figure 2.png”

* *Description*

To find out whether dislodgement could be accurately distinguished from other movements (such as swaying under mild waves) from accelerometer readings, validation tests were conducted in NIOZ racetrack flume. MCAs were deployed in pre-constructed mussel beds in two configurations, loose and chained, and allowed to aggregate for three days. During aggregation, both loose and chained MCAs remained stable, after which they were exposed to strong wave to induce dislodgement.

The related data can be found in the data frame “Dislodgement test.csv”. This file includes one sheet. The columns include “*experiment*”, which indicates the round of the experiment; “*treatment*” describes the treatments (including loose-stable, chained-stable, loose-dislodgement, and chained-dislodgement) applied in each experiment round; “*critical*” records the near-bed orbital velocity required to dislodge MCAs under each treatment. This data can be used to produce the Figure 2.png.

**Flume study – Long exposure experiment**

* *Data*

“Long exposure experiment.csv”

* *Figure*

“Figure 5.png”

* *Description*

Mussel beds were pre-constructed in NIOZ race-track flume to evaluate the effects of storm duration on mussel bed dislodgement. A total of 16 mussel beds were constructed under four treatments (*Calm, Calm-Storm, Wavy, Wavy-Storm*), with four replicates each. After each treatment, the mussel bed was subjected to dislodgement threshold quantification.

The related data can be found in the data frame “Long exposure experiment.csv”. This file includes one sheet. The columns include “*experiment*”, which indicates the round of the experiment; “*treatment*” describes the treatments applied in each experiment round; “*velocity*” records the near-bed orbital velocity required to dislodge mussles under each treatment. This data can be used to produce the Figure 5.png.